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## **Scope of Work**

Vigor Shipyards Habitat Projects

Seattle, Washington

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July 2020

***Final***

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## ACRONYMS AND ABBREVIATIONS

<b>Acronym/ Abbreviation</b>	<b>Definition</b>
Boeing	The Boeing Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Seattle
DNR	Washington State Department of Natural Resources
MLLW	Mean Lower Low Water
NOAA	National Oceanic and Atmospheric Administration
NRD	Natural Resource Damages
OMMP	Operations, Monitoring, and Maintenance Plan
Performing Parties	Vigor Industrial, LLC and ExxonMobil Corporation
SCO	Sediment Cleanup Objective
SMS	Sediment Management Standards
SOW	Scope of work
SW Yard Project	Southwest Yard Habitat Project

<b>Acronym/ Abbreviation</b>	<b>Definition</b>
Trustees	Natural Resource Trustees
TSSOU	Todd Shipyards Sediment Operable Unit
USEPA	U.S. Environmental Protection Agency
Vigor	Vigor Shipyards Corporation
WW Bench	West Waterway Habitat Bench

## **SCOPE OF WORK**

### **Vigor Shipyards Habitat Projects**

### **Seattle, Washington**

#### **1.0 INTRODUCTION**

This document is Appendix A to the Consent Decree, incorporating the settlement of Natural Resources Damages (NRD) associated with the Vigor Shipyards Corporation (Vigor) property (hereafter referred to as the Property). The Property is located adjacent to the West Waterway of the Lower Duwamish River within the Harbor Island Superfund Site (Tax Parcels 7666702805, 7666702851, 7666702852, and 7671800254). The sediment remedial action area associated with the Property is identified as the Todd Shipyards Sediment Operable Unit (TSSOU). This document describes the scope of the work required to comply with the terms of the NRD settlement. In accordance with the Consent Decree, implementation of the Scope of Work (SOW) is the joint responsibility of Vigor Industrial, LLC and ExxonMobil Corporation (the Performing Parties).

Due to the industrialization of the Lower Duwamish River, off-channel habitats used by juvenile salmonids, birds, and other estuarine species have been largely eliminated, which results in limited spring/summer off-channel rearing habitat and limited high-flow refuge. Riparian functions have also been greatly reduced by diking and stream bank development, which results in reduced shading and input of leaf litter and insects. Off-channel and riparian habitats have been identified as limited factors for Green River anadromous salmonid populations. The Vigor NRD settlement has been designed to increase the area and functions value of habitat for salmonids and other resource species.

The type of off-channel habitat to be constructed is considered to be highly desirable by both the National Oceanic and Atmospheric Administration's (NOAA's) Lower Duwamish River Restoration Plan (NOAA 2013) and the Duwamish Blueprint prepared for the Water Restriction Inventory Area 9 Watershed Ecosystem Forum (Ostergaard et al., 2014). As a whole, the West Waterway habitat serves an important function for salmonid species, acting as a migration corridor and final refuge between up-river spawning habitats and the relatively unprotected Elliott Bay estuary, and at an important location relative to equilibration from fresh to salt water.

Along this reach there is only a limited amount of existing habitat, including the intertidal bench in the TSSOU constructed as part of this NRD settlement (the West Waterway Habitat Bench [WW Bench], described below) and Lockheed Yard 1 (Port of Seattle Terminal 10) located on the southwest shore of Harbor Island. These small habitat areas are disproportionately significant as refuge places and are particularly valuable because of the overall habitat scarcity within this reach. Because of their scarcity, these habitats serve as a limiting factor on the overall health of salmonids in the Lower Duwamish River environment. These intertidal habitats constructed within the last 10 years serve as a food source for salmonids and are valuable refuge and rearing areas. However, the WW Bench and habitat associated with Lockheed Yard 1 are approximately 2,000 feet apart. The proposed off-channel habitat (hereafter referred to as the Southwest Yard Habitat Project [SW Yard Project]) will be located between the two intertidal habitat areas, thus shortening the time it will take salmonids to travel between the higher quality habitat areas. The off-channel

habitat will provide important habitat diversity, be unique within this industrialized reach, and support important ecosystem processes.

This document describes the scope of the work required to comply with the terms of the NRD settlement, which includes two habitat projects:

1. WW Bench:<sup>1</sup> the permanent removal of overwater coverage, creosote-treated piling removal, and the intertidal restoration project completed in 2006; and
2. SW Yard Project: implementation of additional removal of overwater coverage and creosote-treated piling, and construction of additional estuarine habitat, including conversion of upland dry lands to aquatic habitat.

Between the two projects, the following elements have been or will be implemented by the Performing Parties:

- Creation of approximately 0.29 acres of riparian buffer between +18 and +12 feet Mean Lower Low Water (MLLW).
- Creation of approximately 0.35 acres of off-channel habitat with marsh vegetation between +5 and +12 feet MLLW.
- Creation of approximately 3.14 acres of intertidal habitat between -2 and +5 feet MLLW.
- Removal of approximately 2.74 acres of overwater coverage.
- Conversion of approximately 1.48 acres of uplands to habitat area.
- Removal of approximately 5,770 creosote-treated pilings.
- At the time of construction, as a one-time pilot, voids within riprap armored slope above elevation -10 feet MLLW will be filled with habitat mix.<sup>2</sup> This is to be conducted over approximately 3 acres and is not intended to be replenished if erosional forces cause the habitat mix to move downslope.

Quantification of the habitat restoration elements for both the WW Bench and the proposed SW Yard Project is presented in Table 1. This table clarifies which elements have already been constructed and which actions will be undertaken as requirements under the NRD Settlement CD.

An Operations, Monitoring, and Maintenance Plan (OMMP) for the TSSOU was approved by the U.S. Environmental Protection Agency (USEPA) in 2007 (Floyd|Snider 2007) as part of the TSSOU sediment cleanup. The OMMP describes the design of the WW Bench and the long-term physical monitoring of the WW Bench that was implemented annually between 2007 and 2011 in

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<sup>1</sup> In the Todd Shipyards Sediment Operable Unit Draft Final Design Report, April 20, 2003, the EPA cleanup requirements were described in detail. Also stated was Todd's intent to construct additional habitat improvements for the purpose of future NRDA credit (page 5-33). The Trustees accepted this documentation as a clear delineation of what was required by EPA as part of the cleanup versus what was above and beyond to avoid any double counting issues related to accepting additional habitat improvements for NRDA as part of this settlement.

<sup>2</sup> "Habitat mix" in this document refers to clean, naturally occurring round or sub-angular river sand and gravel. Requirements for habitat mix grain size distribution for different locations on the project will be determined during design in collaboration with the Trustees. Habitat mix will be selected to be the smallest grain size appropriate to the specific area wave climate that will support habitat use without jeopardy of rapidly eroding away.

accordance with the OMMP. The required physical monitoring includes visual monitoring surveys by divers of the substrate surface (habitat mix) along several transects of the WW Bench.

During the 2011 monitoring event (Year 4), video footage along with diver observations confirmed that the habitat mix remains in place and there are no areas of significant erosion of the habitat mix along these transects. The area is well colonized by marine life and algae, which will continue to assist with material stability over time. An observation of the WW Bench was performed by the Natural Resource Trustees (Trustees) in September 2015, which additionally confirmed that the bench is providing habitat for small fish, is colonized by marine algae, and is generally performing as intended. The most recent survey was the Year 9 physical integrity monitoring survey in the fall of 2016, which continued to show that the cap material was stable. As of 2016, long-term monitoring of the capped areas under the OMMP is considered complete, and no further routine monitoring is required.

Additional monitoring of the WW Bench to be conducted under this SOW is described in Section 6.0 and Table 2A.

The following issues are addressed in this SOW:

- The proposed concept for the SW Yard Project
- The process that will be used to refine the design of the SW Yard Project
- The site-specific investigations that will be undertaken as part of the design process for the SW Yard Project
- The maintenance and monitoring program that will be implemented to ensure that the objectives of the restoration are met
- The success criteria and monitoring methods and frequency that will be used for the project, both at the SW Yard Project and the WW Bench

## **2.0 SOUTHWEST YARD HABITAT PROJECT DESCRIPTION**

The proposed SW Yard Project is designed to maximize the value of habitat by: optimizing the area and quality of off-channel habitat of intertidal area and marsh vegetation; optimizing the riparian buffer; constructing a perimeter berm to protect the off-channel habitat from West Waterway wave action, while constructing multiple openings to the off-channel habitat area to encourage fish passage; and restricting uses within the open water area directly north of the constructed off-channel habitat.

### **2.1 SOUTHWEST YARD HABITAT PROJECT**

The construction elements of the proposed SW Yard Project are shown in Figures 1 through 6. For construction of the proposed SW Yard Project, the existing Pier 1, Ship Building Ways, Pier 1A, and Pier 2P will be demolished, and associated creosote-treated pilings removed. A small portion of Pier 2P will be rebuilt, as it is necessary for shipyard access.

Final sediment cleanup will be conducted below the demolished structures in accordance with Vigor's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Consent Decree, Civil Action No. CV03-1179 with the USEPA.

The proposed new habitat area will prioritize intertidal habitat area, fringed by marsh vegetation and a vegetated riparian buffer. The off-channel habitat area will be designed to encourage fish passage from the West Waterway channel into the habitat area and will also have an opening for fish passage to the northeast. An initial conceptual design for the proposed habitat area is shown in Figures 1-6. The design will be further refined during the design process undertaken per this SOW, as defined in Section 3.0. The design process will determine the final combination of intertidal area and marsh vegetation to be constructed, as well as the final configuration of the perimeter berm, channel openings, and migration channel. Construction of the proposed habitat elevations requires placement of a significant wedge of new fill to raise and expand the area. Clean material dredged from the basin between Pier 1 and Pier 3 will be used to construct the majority of the fill. Imported riprap will form the exterior surface of the fill to stabilize the steep exterior slopes and to construct the berms that protect the off-channel habitat from wave action. A protective berm will be constructed to protect the off-channel habitat from West Waterway wave action created by vessel wakes and storm fetch. A migration corridor, a minimum of 15 feet in width, will be constructed outside of the protective berm to facilitate fish migration leading into and out of the habitat area. A debris boom will be designed for installation across the West Waterway channel opening, to protect the off-channel habitat area from damage by floating debris, while minimizing impact to fish passage.

Within the off-channel habitat area, imported clean materials<sup>3</sup> will be placed, to a minimum 4-foot thickness, to support marsh vegetation, and as beneficial habitat substrates. Habitat substrates will be selected during the design process, based on review of habitat substrates in similar estuary environments (refer to Section 3.5). Clean topsoil will be placed within a riparian buffer, to be located to the south and east of the new marsh, and in zones along the protective exterior berm. Habitat mix, with grain size for specific areas determined during design, will be placed within the intertidal habitat areas, including the migration corridor to be located offshore of the protective berm. The protected interior of the off-channel habitat area will be able to support a finer-grained habitat mix. At the time of construction, voids within riprap armored slope above elevation -10 feet MLLW will be filled with habitat mix.

Habitat substrates within the vegetated marsh areas and the proposed habitat mix gradation for intertidal areas will be selected and specified with the Trustees' input and approval. The marsh and riparian buffer areas will be planted with appropriate vegetation, to be determined with the Trustees' input. The selection of appropriate vegetation will utilize findings from the habitat parameter investigation described in Section 3.5. Large woody debris will be placed to increase habitat complexity.

The Performing Parties will work with the Trustees to design the bathymetry within the off-channel habitat area to achieve an optimal layout and elevations. Additionally, the Performing

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<sup>3</sup> Sampling and analysis will be performed to assure that all imported material and all constructed habitat surfaces are confirmed clean for all constituents per the Sediment Quality Standards (SQS), also known as the Sediment Cleanup Objectives (SCO) presented in the Sediment Management Standards (SMS; Washington Administrative Code 173-204).



Parties will work with tribal representatives to locate net anchors in the SW Yard Project area at optimal locations to facilitate tribal fisheries.

## **2.2 OPEN WATER RESTRICTED USE AREAS**

Vigor will restrict activities within the open water areas north of the new habitat area, to protect the habitat area from shading and impact, and to reduce noise and vessel movement impacts to migrating salmon, while maintaining shipyard operations associated with Pier 3.

Three zones have been defined within the open water area and are shown on Figure 3. These zones are defined as follows:

1. Zone 1, within 170 feet from the face of Pier 3: Unrestricted Shipyard Operations. Potential future drydock moorage must be within this area.
2. Zone 2, between 170 feet and 250 feet from the face of Pier 3: Shipyard Operational Area, with Restrictions. Potential future structures are restricted to dolphins; no piers. There are no restrictions on moorage. Between March 1 and June 30 of each year, non-emergency motorized vessel operations are restricted to 3 hours maximum duration per 24-hour period, to minimize noise and vessel movement impacts to migrating salmon.
3. Zone 3, more than 250 feet from the face of Pier 3 (immediately north of the habitat protected area): Open Water Restricted Area. No structures or moorage allowed. Vessel access is allowed for temporary support operations only. Between March 1 and June 30 of each year, non-emergency motorized vessel operations are restricted to 3 hours maximum duration per 24-hour period, to minimize noise and vessel movement impacts to migrating salmon. Vessels will be able to access this area while moving, but they will not be allowed to anchor or moor, unless necessary for maintenance or monitoring of the habitat area. Vessels operating in this area will support vessels necessary for short positioning operations, safety, environmental protection, emergency response, or tribal fishing. Vessels in this area will include skiffs or tugs that will be involved in the process of positioning a larger vessel or drydock at Pier 3, or vessels used to support maintenance of the habitat area, deploy booms, inspect the wharf, or provide emergency response.

## **3.0 DESIGN PROCESS**

The proposed concept for the SW Yard Project is presented in Section 2.0. Approximately 2.4 acres of new intertidal, marsh, and riparian area will be created consisting of:

- 0.24 acres of riparian buffer
- Approximately 2.15 acres of off-channel habitat including intertidal area marsh vegetation and migration corridor with an agreed upon design developed with Trustees

The Trustee/Performing Parties design team will refine the SW Yard Project concepts within the identified project boundaries to maximize the habitat functions and values. The final design of the SW Yard Project will restore/create at least 90 percent of the areas identified above, or a lesser amount if otherwise approved by the Trustees.

The Performing Parties will submit design documents to the Trustees for review and approval at multiple stages of design. This process will facilitate Trustee involvement and support throughout the design process, and consistency between design and permitting. This process, and the specific design documentation required, is described in Section 7.1.

Final design of the SW Yard Project must be approved by the Trustees before the Trustees authorize the Performing Parties to begin construction.

The investigations or evaluations required to support design and construction are discussed below.

### **3.1 ENVIRONMENTAL EVALUATION**

**Upland Soils.** A Pre-Design Investigation will be conducted to determine the quality of existing soil that will be exposed following demolition of the Ship Building Ways, and which will form the deeper underlying soils below the imported substrates to be placed within the marsh habitat area. It is anticipated that the pre-design investigation will be conducted utilizing Geoprobe borings, which will be installed through holes cut in the existing Ship Building Ways surface.

A Sampling and Analysis Plan (SAP) for the pre-design investigation was developed in early 2018 by the Performing Parties. The SAP was reviewed and approved by USEPA and the Trustees in July 2018. The SAP compiles existing information on soil and groundwater quality and historical use; defines the site conceptual model for contaminant transport; and, based on the conceptual model, defines the location and depth of borings, sampling frequency, and protocols. The SAP also defines analytical methods and appropriate soil quality criteria to be used in evaluation of resultant data. The results of the environmental evaluation will be utilized to determine with USEPA and the Trustees whether any soil remedial action should be conducted in conjunction with construction of the habitat project.

**Habitat Surfaces.** Sampling and analysis will be performed to assure that all imported material and all constructed habitat surfaces are confirmed clean for all constituents per the Sediment Quality Standards (SQS), also known as the Sediment Cleanup Objectives (SCO) presented in the Sediment Management Standards (SMS; Washington Administrative Code 173-204). Analytical procedures and suitability criteria will be reviewed and approved by the Trustees and USEPA as part of the final design process. Following construction completion, monitoring for potential recontamination will be performed as described in Section 6.2.

### **3.2 GEOTECHNICAL AND HYDRODYNAMIC EVALUATION**

In support of the WW Bench engineering design, Coast & Harbor Engineering performed a design evaluation study (Appendix C of the OMMP; Floyd|Snider 2007). This study developed design criteria for the substrate fill and submerged riprap steep slope based on a site-specific hydrodynamic evaluation and evaluated stability of substrate fill, the proposed rock buttress fill design, and the submerged riprap slope transition to the substrate mix backfill layer. This evaluation included the assessment of the wave action and erosive forces that will be acting on the WW Bench.

The SW Yard Project will be designed utilizing the information derived for the WW Bench design, and additional geotechnical input. Specific habitat mix gradations will be selected for the different areas of the site, based on anticipated wave action and vessel wake forces. Habitat mix gradation

for each area will be reviewed and approved by the Trustees during design review. As the design process moves forward, other geotechnical considerations will be evaluated as needed.

### **3.3 STORM DRAIN AND UTILITY RECONFIGURATION EVALUATION**

Significant areas of the shipyard will be demolished to enable construction of the SW Yard Project. Prior to design, the existing utilities and storm drains in the affected area will be surveyed and evaluated. The design for structural demolition of Pier 1, Pier 1A, the Ship Building Ways, and Pier 2P will include design for decommissioning or rerouting of affected utilities. All storm drainage within the area defined as “light industrial” in the Vigor Shipyard NPDES permit, including all storm drainage within the area affected by the SW Yard Project, will be rerouted. New stormwater conveyance will be installed, and stormwater treatment will be provided, to meet Ecology’s water quality requirements. Storm drain rerouting will be designed to avoid impact to the off-channel habitat area. Preliminary plans for storm drain rerouting will be reviewed by the Trustees and Ecology’s Water Quality Program during design.

### **3.4 UNDER-PIER SEDIMENT CLEANUP**

As an integral part of the habitat construction project, final sediment cleanup will be conducted below the demolished pier structures in accordance with Vigor’s CERCLA Consent Decree, Civil Action No. CV03-1179 with the USEPA, and in accordance with lease terms between Vigor and the Washington State Department of Natural Resources (DNR). During the sediment remedial action for the TSSOU conducted in 2005, under-pier contaminated sediments in this area were covered with 1 foot of sand. The USEPA and DNR agreements with Vigor state that at such time that the pier structures are demolished, the under-pier sediments will be permanently remediated. In order to construct the proposed habitat project, Piers 1, 1A, shipways and Pier 2 Platform will be demolished. This pier demolition will make under-pier contaminated sediments accessible for permanent remediation. The approximate locations of under-pier contaminated sediments to be remediated as part of this project are shown on Figures 4, 5, and 6.

Under the direction of USEPA, per the terms of the CERCLA Consent Decree, under-pier sediments to be remediated as part of this project will be characterized, alternatives for permanent remediation will be evaluated, and a preferred approach will be agreed to and documented following CERCLA requirements. Sediment characterization will be performed as an element of the SAP described in Section 3.1. A Remedial Action Work Plan, approved by USEPA, will define the work to be performed. The remedial construction will be included in the habitat project design, with associated specifications for conducting and documenting the work.

### **3.5 HABITAT PARAMETER IDENTIFICATION**

To assist in informing the design of habitat features for the proposed SW Yard Project, a review of habitat projects and inventories that have been completed along the Lower Duwamish River will be conducted. The review of habitat projects will be conducted in consultation with the Trustees and will identify similar habitat areas in the intertidal zone and high marsh zone (-2 to +12 feet MLLW) that currently exist in the northerly reaches of the Lower Duwamish River (north of the 1<sup>st</sup> Avenue South Bridge), including the East and West Waterways. The existing or restored vegetation within these areas will be evaluated. Documents to be reviewed include the literature review and habitat survey conducted per The Boeing Company’s (Boeing’s) NRD Settlement Scope of Work (Boeing 2009) and research completed by Bluefields Holdings on

behalf of the City of Seattle (City) for several City properties along the Waterway. Results of recent monitoring of juvenile salmonid use of restoration sites in the Lower Duwamish will also be reviewed to evaluate effects of elevations on fish access and use.

To further guide the planting design and establishment of native plant communities, additional reference sites will be investigated outside the Lower Duwamish Waterway. Three locations will be selected in collaboration with the Trustees that exhibit the following characteristics:

- Estuarine intertidal marshes situated at the mouth of a river
- Marshes with established plant material thriving within the +5 to +12 feet MLLW elevation range
- Sites located in areas of Puget Sound with salinity and tidal conditions similar to Elliott Bay

This use of reference sites to inform plant material selection is necessary given the unique location of the SW Yard Project at the mouth of the river. During pre-design of the SW Yard Project, these estuary reference sites will be inventoried and assessed to provide site-specific data regarding plant species composition, elevation, structure, and function to guide the restoration design for the Vigor site. Characteristics to be inventoried at the reference sites will include:

- Position in the watershed (proximity to the mouth of a river)
- Position in Puget Sound, salinity, and tidal characteristics
- Plant community species composition, distribution, elevation, and structure with emphasis on the dominant species and successional stage
- Soils with emphasis on soil texture, the quantity/quality of the organic component, and evidence of hydric soils
- Hydrologic characteristics and key structural and topographic features such as rock substrate, wet depressions, tidal creek conditions, riparian slope and swales, etc.

Reference sites will be used during the design phase of the project only, to inform plant material and substrate selection. Reference sites will not be used for comparison during monitoring.

#### **4.0 PERMITS REQUIRED PRIOR TO CONSTRUCTION**

Permits that will be required for construction of the SW Yard Project include:

- U.S. Army Corps of Engineers: Section 10 Work in Navigable Waters
- U.S. Army Corps of Engineers: Section 404 Discharge of Dredge or Fill Material
- Washington State Department of Ecology: 401 Water Quality Certification
- Washington State Department of Fish and Wildlife: Hydraulic Approval Project
- City of Seattle: Shoreline Substantial Development
- City of Seattle: Building and Grading

In-water permits will be acquired through the Joint Aquatic Resource Permit Application (JARPA) process. The JARPA will be provided to the Trustees. A National Environmental Policy Act (NEPA) DNS will be prepared for the project. The lead agencies for the State Environmental Policy Act (SEPA) and NEPA processes will be determined prior to permitting.

In addition to the permits listed above, an Aquatic Use Authorization from DNR is applicable. A portion of the proposed habitat will be constructed on State-Owned Aquatic Lands. In 2004, Vigor and DNR negotiated a new lease for the properties. This lease anticipated construction of NRD restoration projects, and defined NRD restoration as a permitted use. DNR will review and approve plans for the work to be performed on their property.

Additionally, Vigor's Individual National Pollutant Discharge Elimination System (NPDES) Permit with the Washington State Department of Ecology will need to be amended, to include updates for the reconfigured storm drains.

## **5.0 CONSTRUCTION, INITIAL HABITAT CREATION, AND INITIAL PLANTINGS**

After receiving written authorization from the Trustees to begin construction, the Performing Parties shall construct the project according to the SW Yard Project design developed under Section 3.0 of this plan. The construction phase of the SW Yard Project will include initial development of habitat and required plantings. Habitat development and initial planting shall be implemented to achieve the success criteria described in the following section.

## **6.0 MAINTENANCE AND MONITORING**

The SW Yard Project and WW Bench areas will be protected in perpetuity through deed restrictions implemented under the Consent Decree. Both areas will be maintained and monitored to ensure that the habitat restoration projects meet Trustee objectives. This section describes the Maintenance and Monitoring Plan that will be developed to ensure successful habitat restoration projects.

The Maintenance Plan will comprise two sections:

- Initial maintenance and adaptive management during the 10-year performance monitoring period.
- Additional maintenance and monitoring that will be conducted for an additional 20 years after the initial 10-year monitoring period.
- The intention of the Performing Parties and the Trustees is that the ecological functions provided by the habitat projects be maintained in perpetuity. The provisions of the Consent Decree address long-term stewardship and require Vigor to ensure that the property will not be used in a manner inconsistent with this intent.
- The Performing Parties will develop a long-term stewardship plan to be implemented after the initial 30-year monitoring period is completed to ensure that the project continues to function as intended. The long-term stewardship plan will be submitted

for Trustee review and approval following the initial 10-year performance monitoring period.

The initial 10-year maintenance requirements will be developed to ensure that newly planted vegetation becomes established and is not out-competed by invasive species or destroyed by herbivores. The long-term maintenance component of the plan will describe the maintenance activities that will be conducted after the initial 10-year monitoring. Elements included in the maintenance plan are discussed in Section 6.1.

A Monitoring Plan will be developed and followed to determine if the goals and objectives of the SW Yard Project are being achieved. The success criteria, monitoring methods, and frequency are discussed in Section 6.2 and summarized in Tables 2A, 2B, and 2C.

The physical monitoring defined in Table 2A is applicable to the WW Bench as well as the SW Yard Project. The monitoring schedule for physical monitoring at the WW Bench will be concurrent with the SW Yard Project. Monitoring defined in Tables 2B and 2C is applicable to the SW Yard Project only.

Monitoring plans and their implementation are additional key factors in a successful restoration project. Implementation of a monitoring plan will determine if:

- Restoration objectives are being met.
- The maintenance plan is sufficient.
- Contingency measures need to be taken.
- Adaptive management strategies need to be implemented.
- Contingency measures or adaptive management strategies are successful.

## 6.1 MAINTENANCE PLAN

The Maintenance Plan will include methods, frequency, and duration for the following activities:

- **Watering.** Watering will be necessary during plant material establishment. Plantings in some areas may require permanent watering. Weather information will be reviewed to evaluate during what portions of the year watering will be necessary. Monitoring of rainfall and/or soil moisture will be used to determine the need for watering during the first 2 years after plant installation. Watering methods will be defined in the Maintenance Plan.
- **Mulching.** Mulching will occur during initial plant installation. Supplemental mulching may occur during weeding activities, as necessary.
- **Weeding.** Weeding around shrubs will be important during the summer of the first year to ensure establishment and prevent stress to the plants from competition for resources. The frequency can be gauged by necessity but should occur at least twice during the spring (ideally May and June), and then once more during the summer months (August or September). Table 3 provides a list of common weed species that will need to be removed. Weeding will be performed using simple hand tools, (e.g., rakes, hoes). Chemical treatment (herbicides) will be considered only if physical removal fails.

- **Dead Plant Removal.** Dead plant material will only be removed after scheduled monitoring to allow for the accurate assessment of planting success needed for the monitoring program. Replacement planting will be detailed under contingency measures in the monitoring plan.
- **Herbivore Control Measures.** Herbivore barriers and plant protection devices will be visually inspected for maintenance issues. Initially, control measures will be inspected at a high frequency, and immediate repairs will be made as necessary until plants are established.
- **Debris Removal.** Anthropogenic material that potentially impairs habitat functions will be removed from the sites on an as-needed basis. Debris removal is relevant to both the SW Yard Project and the WW Bench project areas.

Long-term maintenance will be conducted for 20 years after the initial 10-year period to ensure that the habitat functions of the SW Yard Project and the WW Bench are maintained. This includes maintaining vegetation and other habitat attributes, controlling invasive vegetation, removing debris, and undertaking actions to address disturbances or perturbations with a foreseeable probability of occurrence, excluding “force majeure” events as defined under the Consent Decree if the Trustees agree that a “force majeure” event makes corrective action or further maintenance impossible. The plan will include a description of activities that will be conducted to maintain the ecological function of the SW Yard and WW Bench Projects. These activities will be conducted on an as-needed basis.

## 6.2 MONITORING PLAN

The monitoring plan elements are summarized in Tables 2A, 2B, and 2C.

**Goals and Objectives.** The goal of the Vigor habitat restoration projects is to create self-sustaining habitats that will restore and enhance ecosystem processes that support the array of key species groups the Trustees believe may have been injured due to contamination in the Lower Duwamish River. The proposed SW Yard Project is intended to restore important habitat types historically present in the Lower Duwamish River and provide appropriate habitat diversity and ecological niches necessary for foraging and refuge opportunities for juvenile salmon, birds, and resident fish species.

**Success Criteria.** Success criteria will be used during the monitoring period to determine if the habitat project goals are being met. The criteria chosen are adapted from monitoring guidelines developed for the Lower Duwamish River (EBDRP 2000) and Commencement Bay (CBNRT 2000) restoration projects and other sources of monitoring guidelines. These success criteria were applied in the Boeing habitat restoration completed in 2015 as described in their SOW (Boeing 2009). The success criteria presented here are modified from those applied in the Boeing habitat restoration to apply to the Vigor habitat restoration projects. The criteria are chosen because they are standards that can be measured and for which there are contingency or adaptive management measures that can be applied during the monitoring period.

- Physical Criteria
  - Intertidal habitat area integrity

- Material stability
- Sediment/soil structure
- Tidal circulation
- Elevation and channel morphology
- Biological Criteria
  - Marsh vegetation areal coverage
  - Marsh vegetation community survival
  - Non-native or invasive species areal coverage
  - Herbivore control measures
  - Riparian vegetation areal coverage
  - Riparian vegetation community survival

All physical and biological criteria are applicable to the SW Yard Project, as the SW Yard Project off-channel habitat includes fine-grained substrates, tidal channels, marsh, and riparian vegetation. Only the physical criteria of intertidal habitat area integrity and material stability are applicable to the WW Bench.

**Monitoring Frequency.** A detailed as-built survey will be completed within 30 days after the initial planting. Monitoring will occur over a 10-year period, at the frequencies defined in Tables 2A, 2B, and 2C. Biological monitoring will be performed during the growing season after deciduous plants have flowered or leafed out.

**Contingency Measures.** Contingency measures will be developed as part of the Monitoring Plan for each success criterion in the event that a standard is not met. Contingency measures are activities designed to help meet success criteria, such as replacing (replanting) dead plant material, adding soil amendments, installing supplemental irrigation, and augmenting herbivore exclusion systems. Prior to any contingency measure being implemented, an investigation as to why the criterion was not met will be conducted. In the event that a success criterion is not met because of installation flaws or lack of routine maintenance, then contingency measures will be implemented as determined by the Trustees. If the success criterion is not met because of design flaws or mortality due to herbivory, or because routine maintenance is not sufficient, then an adaptive management approach will be used, in consultation with and as approved by the Trustees.

**Adaptive Management.** Prior to any adaptive management measures being implemented, the cause for the failure to meet a success criterion will be investigated and will be discussed with the Trustees and the proposed measures approved by the Trustees. Adaptive management measures could include, but are not limited to, changing plant species, changing plant densities, adding fertilizer, or installing additional herbivore exclusion systems.

**Monitoring Methods.** Monitoring methods are identified in Tables 2A, 2B, and 2C where practical. The Performing Parties/Trustee team will further develop the methods to be used for monitoring the physical and biological parameters identified in Tables 2A, 2B, and 2C, during the development of the Monitoring Plan. The methods will be documented as standard operating procedures in the Monitoring Plan.



### 6.2.1 Physical Monitoring

Physical monitoring will be conducted at both the SW Yard Project and the WW Bench. Physical monitoring will address intertidal habitat area integrity, material stability, tidal circulation, sediment/soil structure, and elevation/channel morphology. Specific physical monitoring success criteria, monitoring tasks, monitoring methods, schedule, and contingency measures are described in Table 2A.

### 6.2.2 Biological Monitoring

As described above, the SW Yard Project is intended to restore important habitat types historically present in the Lower Duwamish River, including tidal marsh and riparian vegetation. Elevations suitable for tidal marsh development will be planted with aquatic vascular plants within the footprint of the SW Yard Project. The goal of the marsh plantings is to establish tidal marsh communities that will provide critical habitat functions, such as feeding and refuge for anadromous salmonids and other species. The establishment of marsh vegetation is one of the primary objectives of the Trustees. Wetland vegetation is one of the most obvious and straightforward indicators of habitat condition. Vegetation provides habitat structure for aquatic and terrestrial organisms, facilitates sediment accretion and build-up of marsh substrate, and serves as a source of organic material to support detritus-based food webs.

The proposed restoration will create a large area that is suitable for intertidal habitat and tidal marsh colonization. After demolition of Pier 1A, the Ship Building Ways, Pier 1, and Pier 2P, the shoreline will be filled and appropriate elevations will be planted with marsh vegetation. Changes in vascular plant populations often lag behind environmental changes, because most species are limited in their ability to become established even when the habitat structure is appropriate. Periodic examination of the vegetation will assist in the identification of potential problems, such as colonization by invasive species or excessive herbivore damage. Useful measures of vegetation community condition include areal coverage and survival rates. Biological monitoring success criteria, monitoring tasks, monitoring methods, schedule, and contingency measures are described in Table 2B. The key elements for marsh vegetation biological monitoring are described in the following sections.

#### 6.2.2.1 *Marsh Vegetation Areal Coverage and Survival*

**Success Criteria.** Percent cover of thriving, healthy vegetation of targeted marsh vegetation species should be stable or increasing within the elevations suitable to marsh establishment, with the desired mix of species present. Objectives are 25 percent cover of targeted species at 3 years, 50 percent at 5 years, and not less than 75 percent after 10 years.

**Monitoring Tasks.** An as-planted survey will be conducted following initial planting(s) to confirm that planting(s) are installed per the design specifications. An aerial photograph of the full project area will be collected following initial planting(s) and at each monitoring event.

Post-construction, permanent transects will be placed at equal intervals traversing the marsh area north to south. The project area is controlled by Vigor and is secure with no public access. Therefore, permanently placed stakes will not be disturbed and can be used to re-establish the transects for each sampling period. The number of transects will be based on habitat area and shape to adequately define the entire project. The transects will encompass all portions of the project area

suitable for intertidal vegetation establishment. Permanent photo-points will be established along the transects, and color photographs will be collected during each monitoring event. A general walking inspection of the full marsh area will be made to identify any specific areas of concern regarding vegetative health.

Photographs and inspections will be compared to the identical photographs and inspections from the previous monitoring event, to determine change in areal coverage of targeted marsh vegetation species, and overall vegetative community health and survival. Monitoring will be conducted in Years 0, 1, 2, 3, 5, 7, and 10.

**Contingency Measures.** Evidence of decreasing areal coverage of marsh vegetation target species should trigger consideration of contingency measures. Depending on the hypothesized reason for failure, responses could include additional planting, soil amendments, herbivore exclusions, and/or focused stewardship efforts. Assumptions about appropriate plant species, elevation, and other design factors will be reexamined and adjusted if new information suggests adjustment is appropriate.

#### **6.2.2.2 Marsh Area Invasive Species Areal Coverage**

**Success Criteria.** The project should not at any time contain more than 5 percent cover by area of non-native or invasive plant species. Invasive plant species of special concern include, but are not limited to, *Spartina* spp. (cordgrass), *Lythrum salicaria* (purple loosestrife), *Phalaris arundinacea* (reed canarygrass), and *Phragmites communis* (common reed).

**Monitoring Tasks.** Monitoring will be conducted as described above in Section 6.2.2.1. Photographs and inspections will be evaluated for presence of invasive species, and percent cover by area of non-native or invasive species estimated. Monitoring will be conducted in Years 0,<sup>4</sup> 1, 2, 3, 5, 7, and 10.

**Contingency Measures.** Any occurrence of non-native and invasive species exceeding 5 percent by vegetated area will be controlled primarily by physical means (weeding). Physical removal will occur as soon as invasive plants are identified and prior to seed set. Chemical treatment (herbicides) will only be considered if physical removal fails and will only be utilized with Trustee approval. *Spartina* spp. that is found to colonize any portion of the site (irrespective of the areal coverage) will be immediately controlled.

#### **6.2.2.3 Marsh Vegetation Herbivory Avoidance**

**Success Criteria.** Physical herbivore barriers shall successfully prevent damage to vegetation by Canada geese, until vegetation is fully established. Installation of devices must take place before or simultaneous with planting of marsh vegetation.

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<sup>4</sup> “Year 0” is defined as directly following construction completion at the SW Yard Project. This definition of Year 0 will also be used at the WW Bench, so that monitoring dates are concurrent between the two areas. Biological monitoring to be conducted in Year 0 will be conducted within 60 days of completion of planting.

**Monitoring Tasks.** Periodic, and initially frequent, visual inspections of herbivore exclusion systems and immediate repair will be performed to reduce damage until the plant root systems have established themselves.

**Schedule.** Installation of devices must take place before or simultaneous with planting of intertidal vegetation. Devices will be maintained for at least 4 years post-planting (initial planting or replanting). Periodic monitoring will be used to confirm adequate site maintenance of devices. Observations will be logged at each monitoring event for 5 years post-planting (or replanting).

**Contingency Measures.** The Performing Parties shall immediately repair any damage to the herbivore exclusion devices caused by logs, trampling, geese, or other causes. Canada geese can destroy newly planted restoration project sites in a matter of hours. There are several exclusion device designs that have proven successful in studies conducted in the Lower Duwamish River and Commencement Bay, including those based on lessons learned at the recently completed habitat restoration at Boeing.

#### ***6.2.2.4 Biological Contingency Measures***

Failure to meet the success criteria indicates that a basic restoration goal is not being met and will trigger discussions and potential investigations regarding possible causes. Data from an individual monitoring period indicating that a success criteria assessment measure is not in conformance will trigger discussions on the reason that the measure is not in conformance. If contingency measures are judged by the Trustees to be necessary, the Performing Parties will propose contingency measures in consultation with the Trustees and the Performing Parties will, upon the Trustees' written approval, implement the actions during the next 12 months. If the goals are not being met at Year 5, the Performing Parties will, in consultation with the Trustees, conduct an investigation of the reasons for the non-conformance, addressing the following questions:

- Can the cause of the non-conformance be identified?
- Is it technically feasible to modify or adjust the physical, chemical, or biological feature(s) of the marsh, or regulate operation or maintenance of the marsh, such that a parameter could subsequently achieve an acceptable level of development?
- What is the projected success and cost of the proposed modification?

Results of the investigation will determine modifications that may need to be implemented by the Performing Parties, which may include, but not be limited to: replanting, changing plant species, changing plant densities, regrading limited portions of the area, adding soil amendments, and excavating drainage channels. Implementing modifications after Year 5 will require monitoring of the performance assessment measures to continue in Years 6 through 11. Data from an individual sampling year during this period indicating that a performance assessment measure is not in conformance will trigger discussions on the potential to take additional contingency measures.

If the Performing Parties are required to implement corrective actions after Year 5, and have demonstrated best effort to satisfy the performance goals through Years 1 through 5 and Years 6 through 11 (including performing immediate contingency measures as needed), then the Performing Parties will not be required to implement additional corrective actions or conduct monitoring with regard to marsh vegetation past Year 11.

### **6.2.3 Additional Monitoring Requirements**

Additional monitoring requirements to be described in the plan will include fish and invertebrate prey resources that are present within the footprint of the SW Yard Project and will determine whether chemical contamination is present at levels of concern<sup>5</sup> in surface sediments at the SW Yard Project area over time. Detailed requirements are summarized in Table 2C.

#### **6.2.3.1 Fish Presence**

Sampling will be conducted during the peak of the anadromous salmonid juvenile migration period to determine presence and abundance of fish. Fyke nets will be used to collect and identify species and origin (for salmonids, hatchery, or natural origin salmonids) of all fish collected (record fork lengths for salmonids and identify as hatchery or natural origin). Salmonids will be identified to the genus level and species level unless there are specific problems such as the presence of bull trout and identifying them to that level. Non-salmonid fish species should also be identified to at least the genus level.

Monitoring will be conducted three times (early, mid, late) during peak of juvenile salmonid outmigration (March through June). The monitoring is to be conducted during Years 1, 2, 3, 5, 7, and 10. Failure of fish to use the areas could indicate that a basic restoration goal is not being met and will trigger discussions regarding possible causes. The purpose of this monitoring activity is to provide data as requested by the Trustees. There are no success criteria, contingency measures, or adaptive management activities associated with this monitoring requirement.

#### **6.2.3.2 Invertebrate Prey Resources**

Sampling will be conducted once per monitoring year during the peak juvenile salmonid outmigration to assess benthic community development. Benthic organisms will be sampled with 10-centimeter cores. Five samples will be collected in the off-channel habitat area. In each sample that is collected, invertebrates will be identified to the lowest practical taxonomic level and enumerated. In addition, to measure one of the desired functions of riparian vegetation at the site, fallout insects will be sampled using floating plastic bins distributed throughout the vegetated areas of the site. The sampling is to be conducted during Years 1, 2, 3, 5, 7, and 10. Failure of the benthic community to develop could indicate that a basic restoration goal is not being met and will trigger discussions regarding possible causes. The purpose of this monitoring activity is to provide data as requested by the Trustees. There are no success criteria, contingency measures, or adaptive management activities associated with this monitoring requirement.

#### **6.2.3.3 Chemical Contamination**

The restoration sites will be monitored to determine if the habitat substrate (sediment surface) becomes contaminated over time. Samples will be collected in the high marsh and associated tidal channels at locations agreed to with the Trustees. The sampling is to be conducted during Years 2, 5, and 10. Sediments will be sampled using grab samples collecting material representative of the top 10 centimeters. Samples will be evaluated for the SMS chemicals. Sample results will be compared to the SQS, also known as the SCO presented in the SMS (Washington Administrative Code 173-204). Analytical procedures and suitability criteria will be reviewed and

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<sup>5</sup> Levels of concern will be determined by Washington State SQS, described in this document in Section 6.2.3.3.

approved by the Trustees and USEPA as part of the final design process. Areas exceeding criteria will trigger discussions with USEPA and the Trustees on the possible causes and appropriate responses. As described in Section 3.3, several storm drains will be rerouted as part of this project. Storm drain rerouting will be designed to avoid impact to the off-channel habitat area. For storm drain outfalls in the vicinity of intertidal habitat benches, water quality requirements will be defined for Trustee approval.

## **7.0 DOCUMENTATION**

### **7.1 DESIGN DOCUMENTATION**

The Performing Parties will submit design documents to the Trustees for review and approval at multiple stages of design. For each design deliverable, formal comments from the Trustees will be provided. The Performing Parties will produce revised versions of each deliverable addressing Trustee comments and will prepare an accompanying “response to comments” document. This process will facilitate Trustee involvement and support throughout the design process.

The following design deliverables will be submitted for review and approval:

1. Conceptual design of habitat area. This package will define the proposed openings to the off-channel habitat area, elevations and contouring within the habitat area, and general planting zones. Trustee approval of this package will be secured prior to preliminary design.
2. Habitat mix gradations and substrate selection package. This package will include proposed gradation for habitat mixes to be used in different areas of the project, habitat mix material specification, and specifications for other primary substrates to be used within the marsh and intertidal areas. This package will include geotechnical and hydrodynamic rationale for selection. Trustee approval of this package will be secured prior to preliminary design.
3. Preliminary design. This package will include preliminary design for all project elements. The level of detail of preliminary design will be based on what is necessary to support the JARPA application, equivalent to an approximately 60% design level. This package will include grading plans and cross sections, material specifications, description of construction sequencing, and planting plans. This package will also include results of the environmental evaluation, geotechnical evaluation, storm drain and utility reconfiguration evaluation, under-pier sediment cleanup approach, and habitat parameter identification described in Sections 3.1, 3.2, 3.3, 3.4, and 3.5, respectively. Approval of this package will be secured prior to submitting the JARPA.
4. Final design. This package will include final design for all project elements. The final design package will include changes to the project that may be required as part of the permitting process. Approval of the final design package will be secured prior to finalizing construction bid documents. Final design of the SW Yard Project must be approved by the Trustees before the Trustees authorize the Performing Parties to begin construction, per Section 3.0. The final design package will include, at a minimum, the following:
  - Detailed design drawings

- Material specifications
- Description of construction sequencing
- Estimated construction schedule
- Planting plans and plant schedule
- Maintenance and Monitoring Plan as described in Section 6.0

## **7.2 CONSTRUCTION COMPLETION REPORT**

Within 60 days of completion of the construction activities, a construction completion report will be prepared that describes the as-built condition of the SW Yard Project. This report will be submitted to the Trustees with the Notice of Completion of Construction in the manner and as required in the Consent Decree and will serve as the baseline for monitoring that will be conducted as described in Section 6.2.

## **7.3 MONITORING AND MAINTENANCE REPORTS**

After each monitoring event as described in Section 6.0 and Tables 2A, B, and C, a report will be prepared for submittal to the Trustees. A draft report will be submitted to the Trustees within 90 days of each monitoring event. Following Trustee review and comment, reports will be finalized.

The following will be included in each report:

- Dates of monitoring activities
- A narrative description of methods and contingency measures taken
- Identification of planted and naturally recruited trees and shrubs
- Data tables
- Species lists
- Color photographs
- Aerial photographs or maps showing extent of vegetation coverage with dominant vegetation types
- Interpretation of results, evaluation relative to success criteria
- A description of maintenance activities that were conducted

Within 90 days of completion of the monitoring, a monitoring completion report will be submitted to the Trustees with the Notice of Completion of Monitoring. Upon completion of the 10-year monitoring period, the Performing Parties will provide written Notice of Completion of Vegetation and Habitat Development and Monitoring Obligations to Trustees in accordance with Sections VII (Restoration Projects) and XXII (Notices and Submissions) of the Consent Decree.

## **8.0 SCHEDULE**

All required deliverables and implementation steps are identified in Table 4 attached.

Trustee review of deliverables will be completed within 30 days of receipt, unless a longer review timeframe is expressly set forth in the Consent Decree or approved by all parties in advance. Any delay in the Trustees' review of deliverables shall not, of itself, extend the time for performance of any obligation by the Performing Parties. Deadlines for performance of an obligation may be extended due to additional review time by the Trustees if the Performing Parties provide notice and support for the need for an extension and the Trustees agree that the extension is necessary due to the delay.

To accelerate the overall schedule for habitat restoration, at the Performing Parties' discretion, design tasks per Section 3.0 of this document, design documentation (Section 7.1), and initiation of permitting (Section 4.0) may occur prior to the Effective Date of the Consent Decree. Any work conducted by the Performing Parties prior to the Effective Date of the Consent Decree is at the Performing Parties' full risk and cost; the Trustees shall have no responsibility for any costs incurred by the Performing Parties if a Consent Decree is not entered by the Court.

Initiation of Construction is contingent on Consent Decree entry by the Court and Trustee written authorization for the Performing Parties to commence construction, pursuant to Section VII (Restoration Projects) of the Consent Decree.

Additionally, initiation of construction is contingent on receipt of all necessary permits or documentation of substantive compliance from federal, state, and local agencies. Construction work is also contingent on the authorized in-water construction work windows. Completion of demolition, construction, and planting may require multiple in-water work seasons. The SW Yard Project construction will be completed in accordance with the Trustee-approved construction schedule submitted as part of the final design package.

## **9.0 REFERENCES**

Boeing (The Boeing Company), 2009, Boeing Habitat Projects, Attachment A of Consent Decree No. CV-10-758 RSM, Seattle/Tukwila, Washington, December.

CBNRT (Commencement Bay Natural Resource Trustees), 2000, Commencement Bay, Natural Resource Damage Assessment Restoration Monitoring Plan: NOAA, U.S. Department of Interior and the State of Washington, Seattle, Washington.

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- WSNWCB (Washington State Noxious Weed Control Board), 2008, Washington State Noxious Weed List: Washington State Noxious Weed Control Board, Olympia, [http://www.nwcb.wa.gov/weed\\_list/weed\\_list.htm](http://www.nwcb.wa.gov/weed_list/weed_list.htm) (accessed January 21, 2008).



## Tables

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**TABLE 1**  
**QUANTIFICATION OF HABITAT RESTORATION ELEMENTS**  
Vigor Shipyards Habitat Projects  
Seattle, Washington

Natural Resource Benefits		Natural Resource Work at Vigor Shipyards		
		Work Performed as Part of TSSOU Remedial Action (2004 to 2006)	Additional Habitat Restoration in the SW Yard to be Performed as Required by NRD Settlement CD	Total
Habitat Area Restored/Created	Riparian	None	0.29-acre riparian buffer between +18 and +12 feet MLLW	0.29 acres
	Marsh	None	0.35-acre marsh vegetation between +5 and +12 MLLW	0.35 acres
	Intertidal	0.47-acre habitat bench between +2 and -2 feet MLLW	2.03 acres between -2 and +5 MLLW	2.5 acres
Total Area Dedicated to Habitat (Riparian + Marsh + Intertidal)		0.47 acres	2.67 acres	3.14 acres
Overwater Coverage Removed		69,784 sq. ft (or 1.60 acres)	49,800 sq. ft (or 1.14 acres)	2.74 acres
Uplands Converted to Aquatic Habitat Area		None	64,500 sq. ft (or 1.48 acres)	1.48 acres
Creosote-Treated Pilings Removed		Approx. 2,770 piling	Approx. 3,000 piling	5,770 pilings
Riprap Armored Slope Area Softened with Habitat Mix*		99,400 sq. ft (or 2.28 acres) above elevation -10 feet MLLW	33,500 sq. ft (or 0.77 acres) above elevation -10 feet MLLW	3.05 acres

Note:

- \* At the time of construction, as a one-time pilot, voids within riprap armored slope above elevation -10 MLLW will be filled with habitat mix. This is to be conducted over approximately 3 acres, and is not intended to be replenished if erosional forces cause the habitat mix to move downslope.

Abbreviations:

MLLW Mean Lower Low Water  
sq. ft Square feet  
SW Yard Southwest Yard  
TSSOU Todd Shipyard Sediment Operable Unit

TABLE 2A  
SUCCESS CRITERIA FOR RESTORATION PROJECTS (PHYSICAL CRITERIA)  
Vigor Shipyards Habitat Projects  
Seattle, Washington

	Intertidal Habitat Area Integrity (SW Yard Project and WW Bench)	Material Stability (SW Yard Project and WW Bench)	Habitat Mix Stability (SW Yard Project and WW Bench)	Tidal Circulation (SW Yard Project Only)	Sediment/Soil Structure (SW Yard Project Only)	Elevation/Channel Morphology (SW Yard Project Only)
<b>Description:</b>	The total acreage of each elevation zone between +12 ft MLLW and -2 ft MLLW will remain at least 90% of the as-built acreage.	The as-designed contour elevations, especially for plant introductions, will be +/- 0.5 ft of the elevations specified in the construction plan. 75% of the target elevations will be maintained through Year 5.	Habitat mix will remain present in migration corridor and WW Bench.	The tidal amplitude, as determined by both timing and elevation of high and low tide events, is equivalent inside and outside of the project area.	Over time, the site may accumulate fine-grained materials and organic matter. This would be evidenced by a decrease in mean grain size and increase in organic carbon in the surface sediments and site soils. Sediment/soil structure data will be collected to assist in defining potential contingency measures associated with biological monitoring.	The as-designed low gradients necessary for marsh development are stable over time.
<b>Monitoring Tasks:</b>	Estimate the total acreage in each elevation zone between +12 ft MLLW and -2 ft MLLW of the project and provide “as-built” plan drawings upon project completion. Using the "as-builts," and by visual inspection using permanent transects spaced in equal intervals north to south in the marsh areas, identify erosional areas. Visually inspect after extreme episodic flood events to determine erosional impacts.	"As-built" plan drawings will be provided upon project completion. Using the "as-builts," and by visual inspection using permanent transects spaced in equal intervals north to south in the marsh areas, estimate changes in surface topography. Visually inspect after extreme episodic flood events to determine erosional impacts.	Periodic visual inspections at low tide of the migratory corridor and the WW Bench for changes in habitat mix presence and gradation. Inspections will be made at permanent transect locations representative of site conditions.	Periodic visual inspections of the project area for impeded tidal flow, or potential fish stranding. Record tidal stage from tidal gauges during inspections.	Determine grain size distribution and organic carbon determination by collecting core samples in conjunction with benthic invertebrate sampling. Test for total nitrogen using standard analytical techniques (if warranted due to concerns about vegetation health).	Estimate changes in gradient annually (after runoff) and after episodic flood events using permanent transects spaced in equal intervals north to south in the marsh areas.
<b>Monitoring Methods:</b>	Geo-referenced aerial photography, visual inspection, photo-points.	Geo-referenced aerial photography, visual inspection, photo-points.	Low tide visual inspection.	Tidal gauges, visual inspection.	Sampling as defined for benthic invertebrate sampling (Table 2C).	Geo-referenced aerial photography, visual inspection, photo-points.
<b>Schedule:</b>	Years: 1, 2, 5, 7, and 10.	Years: 1, 2, 5, 7, and 10.	Years: 1, 2, 5, 7, and 10.	Years: 1, 2, 5, 7, and 10.	Years: 1, 2, 5, 7, and 10.	Years: 1, 2, 5, 7, and 10.
<b>Contingency Measures:</b>	Observation of deviation from this criterion would trigger investigation into the size of the area affected, evaluation of the cause, and potential actions.	Non-structural approaches such as vegetation, fiber mats, or other such “soft” engineered options, will be considered to stabilize excessive erosion.	Observation of significant erosion or removal of habitat mix would trigger investigation into the size of the area affected, evaluation of the cause, and potential actions.	Failures of tidal circulation or inundation as prescribed for the site triggers discussion of potential remedies.	If the intertidal sediments or upland soils do not support the biological production anticipated, amendments can be considered to augment nutrient deficiencies.	Gradient changes that limit the establishment of marsh vegetation or impact tidal circulation will trigger discussion of potential remedies, which may include both structural and non-structural alternatives.

Abbreviations:

- Year 0 “Year 0” is defined as directly following construction completion at the SW Yard Project. This definition of Year 0 will also be used at the WW Bench, so that monitoring dates are concurrent between the two areas.
- ft Feet
- MLLW Mean Lower Low Water
- SW Yard Southwest Yard Habitat Project
- WW Bench West Waterway Habitat Bench

**TABLE 2B**  
**SUCCESS CRITERIA FOR RESTORATION PROJECTS (BIOLOGICAL CRITERIA)**  
Vigor Shipyards Habitat Projects  
Seattle, Washington

(Biological Criteria in this Table 2B are applicable at SW Yard Project Area only - marsh and riparian zones)

	Marsh Vegetation Areal Coverage and Survival	Marsh Area Invasive Species Areal Coverage	Herbivore Control Measures	Riparian Vegetation Areal Coverage and Survival	Riparian Area Invasive Species Areal Coverage
<b>Description:</b>	Percent cover of thriving, healthy vegetation of targeted marsh vegetation species should be increasing (or stable at maturity) within the elevations suitable to marsh establishment, with the desired mix of species present. Objectives are 25% cover of targeted species at 3 years, 50% cover at 5 years, and not less than 75% after 10 years.	The project should not at any time contain more than 5% cover by area of non-native or invasive plant species within the marsh elevations (below elevation +12 ft MLLW).	Physical herbivore barriers shall successfully prevent damage to vegetation by Canada geese or other herbivores, until vegetation is fully established.	Percent cover of thriving, healthy native riparian vegetation should be stable or increasing over time, and cover not less than 90% of the upland vegetated area of the project after 10 years. A diversity of species should be present - a minimum of 5% cover each of six species shall be present, ideally at least four species other than willow, alter, and cottonwood.	The project should not contain more than 5% cover by area of non-native or invasive plant species.
<b>Monitoring Tasks:</b>	<p>An as-planted survey will be mapped following initial planting(s). The "as-builts" will be used to confirm that the plantings are installed per the design specifications. An aerial photograph of the full project area will be collected following initial planting(s) and at each monitoring event.</p> <p>Post-construction, permanent transects will be placed at equal intervals traversing the marsh area north to south. Permanent photo-points will be established along the transects and color photographs will be collected during each monitoring event.</p> <p>A general walking inspection of the full marsh area will be made to identify any specific areas of concern regarding vegetative health.</p> <p>Photographs and inspections will be compared to the identical photographs and inspections from the previous monitoring event, to determine change in aerial coverage of targeted marsh vegetation species, and overall vegetative community health and survival.</p>	<p>Monitoring will be performed as described for Marsh Vegetation Areal Coverage and Survival.</p> <p>Photographs and inspections will be evaluated for presence of invasive species, and percent cover by area of non-native or invasive species estimated.</p>	<p>Installation of devices must take place before or simultaneous with planting of marsh vegetation.</p> <p>Periodic, and initially frequent, visual inspections of herbivore exclusion systems shall be conducted, with immediate repair to reduce damage until the plant root systems have established themselves.</p> <p>Devices must be maintained for 4 years post-planting (initial planting or re-planting). Periodic monitoring should confirm adequate site maintenance of devices. Observations will be logged at each monitoring event for 5 years post-planting (or re-planting).</p>	<p>An as-planted survey will be mapped following initial planting(s). The "as-builts" will be used to confirm that the plantings are installed per the design specifications. A color aerial photograph of the full project area will be collected following initial planting(s) and at each monitoring event.</p> <p>Permanent photo-points will be established through the riparian zones and color photographs will be collected each sampling period.</p> <p>A general walking inspection of the riparian areas will be made to identify any specific areas of concern regarding vegetative health.</p> <p>Photographs and inspections will be compared to the identical photographs and inspections from the previous monitoring event, to determine change in areal coverage of targeted riparian vegetation species, and overall vegetative community health and survival.</p>	<p>Monitoring will be performed as described for Riparian Vegetation Areal Coverage and Survival.</p> <p>Photographs and inspections will be evaluated for presence of invasive species, and percent cover by area of non-native or invasive species estimated.</p>
<b>Monitoring Methods:</b>	Geo-referenced aerial photography, visual inspection, photo-points.	Geo-referenced aerial photography, visual inspection, photo-points.	Visual inspection.	Geo-referenced aerial photography, visual inspection, photo-points.	Geo-referenced aerial photography, visual inspection, photo-points.
<b>Schedule:</b>	Years: 0, 1, 2, 3, 5, 7, and 10.	Years: 0, 1, 2, 3, 5, 7, and 10.	Years 0 through 5 post-planting (or re-planting). If the plant community is well-established by Year 3, monitoring may be discontinued.	Years: 0, 1, 2, 3, 5, 7, and 10.	Years: 0, 1, 2, 3, 5, 7, and 10.
<b>Contingency Measures:</b>	Evidence of decreasing areal coverage of marsh vegetation target species or evidence in reduction in plant community health and survival will trigger consideration of contingency measures. Depending on the hypothesized reason for failure, responses could include additional planting, soil amendments, herbivore exclusions, and/or focused stewardship efforts. Assumptions about appropriate plant species, elevation, and other design factors will be reexamined and adjusted if new information suggests adjustment is appropriate.	Any occurrence of non-native and invasive species exceeding 5% by vegetated area, will be controlled primarily by physical means (weeding). Physical removal will occur as soon as invasive plants are identified and prior to seed set. Chemical treatment (herbicides) will only be considered if physical removal fails. <i>Spartina</i> spp. that is found to colonize any portion of the site (irrespective of the areal coverage) will be immediately controlled.	<p>Immediately repair of any damage to the herbivore exclusion devices caused by logs, trampling, or geese.</p> <p>If damage is observed from Nutria, protective covers around individual plants or stands will be installed and monitored by visual inspection.</p>	Evidence of reduction in areal coverage of targeted riparian vegetation species or evidence in reduction in plant community health and survival will trigger consideration of contingency measures. Depending on the hypothesized reason for failure, responses could include additional planting, soil amendments, herbivore exclusions, and/or focused stewardship efforts. Assumptions about appropriate plant species, elevation, and other design factors will be reexamined and adjusted if new information suggests adjustment is appropriate.	Any occurrence of non-native and invasive species exceeding 5% by vegetated area, will be controlled primarily by physical means (weeding). Physical removal will occur as soon as invasive plants are identified and prior to seed set. Chemical treatment (herbicides) will only be considered if physical removal fails. <i>Spartina</i> spp. that is found to colonize any portion of the site (irrespective of the areal coverage) will be immediately controlled.

Abbreviations:

- Year 0 “Year 0” is defined as directly following construction completion. Biological monitoring to be conducted in Year 0 will be conducted within 60 days of completion of planting
- ft Feet
- MLLW Mean Lower Low Water
- SW Yard Project Southwest Yard Habitat Project

**TABLE 2C**  
**ADDITIONAL MONITORING REQUIREMENTS**  
Vigor Shipyards Habitat Projects  
Seattle, Washington

(Additional Monitoring Requirements in this Table 2C are applicable at SW Yard Project Area only - marsh and tidal channels)

	Fish Presence	Invertebrate Prey Resources	Chemical Contamination
<b>Description:</b>	Estuarine fish should access the project, with increasing utilization and colonization by resident species. Juvenile salmonids should be present.	Invertebrate prey taxa and fallout insects known to be important to juvenile salmonids should be present.	Habitat substrate sediments should remain free of chemical contamination at levels of concern, determined by Washington State SQS standards.
<b>Monitoring Tasks:</b>	Monitor fish use: Record fork length and source (hatchery or wild) for salmonids. Record presence (species) of non-salmonid fishes. Salmonids will be identified to the genus level and species level unless there are specific problems such as the presence of bull trout and identifying them to that level. Non-salmonid fish species should also be identified to at least the genus level.	Monitor benthic invertebrate community development. Five samples will be collected in the high marsh and associated tidal channels. In each sample that is collected, invertebrates will be identified to the lowest practical taxonomic level and enumerated.  In addition, fallout insects will be sampled using floating plastic bins distributed throughout the site.	The restoration sites will be monitored to determine if the habitat substrate (sediment surface) becomes contaminated over time. Five sediment samples will be collected in the high marsh and associated tidal channels. Samples will be evaluated for the Sediment Management Standards chemicals. Sample results will be compared to the Sediment Cleanup Objectives (benthic SQS - sediment quality standards).
<b>Monitoring Methods:</b>	Fyke net. Nets set before high tide and monitored during subsequent ebb. Monitor three times (early, mid, late) during peak of juvenile salmonid outmigration (typically March through June).	Samples will be collected using grab samples collecting material representative of the top 10 centimeters (cm). Samples will be collected once each monitoring year during the peak juvenile salmonid outmigration.	Sediments will be sampled using grab samples collecting material representative of the top 10 cm. Samples will be collected concurrent with the benthic invertebrate sampling, and adjacent to the benthic invertebrate sample locations.
<b>Schedule:</b>	Years: 1, 2, 3, 5, 7, and 10.	Years: 1, 2, 3, 5, 7, and 10.	Years: 2, 5, and 10.
<b>Contingency Measures:</b>	Failure of fish to use the areas could indicate that a basic restoration goal is not being met, and will trigger discussions regarding possible causes. The purpose of this monitoring activity is to provide data as requested by the Trustees. There are no success criteria, contingency measures, or adaptive management activities associated with this monitoring requirement.	Failure of the benthic community to develop could indicate that a basic restoration goal is not being met, and will trigger discussions regarding possible causes. The purpose of this monitoring activity is to provide data as requested by the Trustees. There are no success criteria, contingency measures, or adaptive management activities associated with this monitoring requirement.	Contamination of the sediment surface at levels of concern could indicate that a basic restoration goal is not being met, and will trigger discussions regarding possible causes and appropriate responses.

TABLE 3  
NOXIOUS WEEDS LIST  
Vigor Shipyards Habitat Projects  
Seattle, Washington

Common Name	Scientific Name	State Listing <sup>1</sup>	King County Listing <sup>2</sup>	Common Name	Scientific Name	State Listing <sup>1</sup>	King County Listing <sup>2</sup>
absinth wormwood	<i>Artemisia absinthium</i>	C	ND	knapweed, spotted	<i>Centaurea biebersteinii</i>	B	B
Austrian fieldcress	<i>Rorippa austriaca</i>	B	B	knapweed, Vochin	<i>Centaurea nigrescens</i>	A	A
babysbreath	<i>Gypsophila paniculata</i>	C	—	knotweed, Bohemian	<i>Polygonum bohemicum</i>	B	ND
blackberry, evergreen	<i>Rubus laciniatus</i>	—	WOC	knotweed, giant	<i>Polygonum sachalinense</i>	B	ND
blackberry, Himalayan	<i>Rubus armeniacus</i>	—	WOC	knotweed, Himalayan	<i>Polygonum polystachyum</i>	B	ND
blackgrass	<i>Alopecurus myosuroides</i>	B	B	knotweed, Japanese	<i>Polygonum cuspidatum</i>	B	ND
blueweed, viper's bugloss	<i>Echium vulgare</i>	B	B	kochia	<i>Kochia scoparia</i>	B	B
Brazilian elodea	<i>Egeria densa</i>	B	B	kudzu	<i>Pueraria montana</i> var. <i>lobata</i>	A	A
buffalobur	<i>Solanum rostratum</i>	A	A	lawnweed	<i>Soliva sessilis</i>	A	A
bugloss, annual	<i>Anchusa arvensis</i>	B	B	lepyrodiclis	<i>Lepyrodiclis holosteoides</i>	B	B
bugloss, common	<i>Anchusa officinalis</i>	B	B	longspine sandbur	<i>Cenchrus longispinus</i>	B	B
butterfly bush	<i>Buddleia davidii</i>	C	ND	loosestrife, garden	<i>Lysimachia vulgaris</i>	B	B
camelthorn	<i>Alhagi maurorum</i>	B	B	loosestrife, purple	<i>Lythrum salicaria</i>	B	B
clary sage	<i>Salvia sclarea</i>	A	A	loosestrife, wand	<i>Lythrum virgatum</i>	B	—
cockle, white	<i>Silene latifolia</i> ssp. <i>alba</i>	C	—	mayweed, scentless	<i>Matricaria perforata</i>	C	—
common catsear	<i>Hypochaeris radicata</i>	B	—	meadow clary	<i>Salvia pratensis</i>	A	A
common crupina	<i>Crupina vulgaris</i>	A	A	Mediterranean sage	<i>Salvia aethiopis</i>	A	A
common fennel	<i>Foeniculum vulgare</i>	B	ND	milk thistle	<i>Silybum marianum</i>	A	A
common groundsel	<i>Senecio vulgaris</i>	C	ND	nightshade, bittersweet	<i>Solanum dulcamara</i>	—	WOC
common reed	<i>Phragmites australis</i>	C	C	nightshade, silverleaf	<i>Solanum elaeagnifolium</i>	A	A
common St. Johnswort	<i>Hypericum perforatum</i>	C	ND	old man's beard	<i>Clematis vitalba</i>	C	ND
common tansy	<i>Tanacetum vulgare</i>	C	ND	oxeye daisy	<i>Leucanthemum vulgare</i>	B	ND
cordgrass, common	<i>Spartina anglica</i>	B	B	parrotfeather	<i>Myriophyllum aquaticum</i>	B	B
cordgrass, dense flower	<i>Spartina densiflora</i>	A	A	perennial pepperweed	<i>Lepidium latifolium</i>	B	B
cordgrass, salt meadow	<i>Spartina patens</i>	A	A	perennial sowthistle	<i>Sonchus arvensis</i>	B	B
cordgrass, smooth	<i>Spartina alterniflora</i>	B	B	poison-hemlock	<i>Conium maculatum</i>	C	ND
cress, hoary	<i>Cardaria draba</i>	C	—	policeman's helmet	<i>Impatiens glandulifera</i>	B	B
curly-leaf pondweed	<i>Potamogeton crispus</i>	C	ND	primrose, water	<i>Ludwigia hexapetala</i>	B	B
dodder, smoothseed alfalfa	<i>Cuscata approximata</i>	C	—	primrose-willow, floating	<i>Ludwigia peploides</i>	A	A
dyers woad	<i>Isatis tinctoria</i>	A	A	puncturevine	<i>Tribulus terrestris</i>	B	—
English holly	<i>Ilex aquifolium</i>	—	WOC	reed canarygrass	<i>Phalaris arundinacea</i>	C	ND
English laurel	<i>Prunus laurocerasus</i>	—	WOC	reed sweetgrass	<i>Glyceria maxima</i>	A	A
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	B	ND	rush skeletonweed	<i>Chondrilla juncea</i>	B	B
fanwort	<i>Cabomba caroliniana</i>	B	B	Russian knapweed	<i>Acroptilon repens</i>	B	B
field bindweed	<i>Convolvulus arvensis</i>	C	ND	rye, cereal	<i>Secale cereale</i>	C	—
fragrant water lily	<i>Nymphaea odorata</i>	C	ND	saltcedar	<i>Tamarix ramosissima</i>	B	B
garlic mustard	<i>Alliaria petiolata</i>	A	A	Scotch broom	<i>Cytisus scoparius</i>	B	ND
giant hogweed	<i>Heracleum mantegazzianum</i>	A	A	Spanish broom	<i>Spartium junceum</i>	A	A
goatgrass, jointed	<i>Aegilops cylindrica</i>	C	—	spikeweed	<i>Hemizonia pungens</i>	C	—
goatsrue	<i>Galega officinalis</i>	A	A	spurge flax	<i>Thymelaea passerina</i>	A	A
gorse	<i>Ulex europaeus</i>	B	B	spurge laurel	<i>Daphne laureola</i>	B	ND
grass-leaved arrowhead	<i>Sagittaria graminea</i>	B	B	spurge, eggleaf	<i>Euphorbia oblongata</i>	A	A
hairy willowherb	<i>Epilobium hirsutum</i>	C	C	spurge, leafy	<i>Euphorbia esula</i>	B	B
hawkweed, mouseear	<i>Hieracium pilosella</i>	B	B	spurge, myrtle	<i>Euphorbia myrsinites</i>	B	ND
hawkweed, orange	<i>Hieracium aurantiacum</i>	B	B	starthistle, purple	<i>Centaurea calcitrapa</i>	A	A
hawkweed, oxtongue	<i>Picris hieracioides</i>	B	B	starthistle, yellow	<i>Centaurea solstitialis</i>	B	B
hawkweed, polar	<i>Hieracium atratum</i>	B	B	sulfur cinquefoil	<i>Potentilla recta</i>	B	B
hawkweed, queen-devil	<i>Hieracium glomeratum</i>	B	B	swainsonpea	<i>Sphaerophysa salsula</i>	B	B
hawkweed, smooth	<i>Hieracium laevigatum</i>	B	B	Syrian bean-caper	<i>Zygophyllum faba</i>	A	A
hawkweed, yellow	<i>Hieracium caespitosum</i>	B	B	tansy ragwort	<i>Senecio jacobaea</i>	B	B
hawkweed, yellow devil	<i>Hieracium floribundum</i>	A	A	Texas blueweed	<i>Helianthus ciliaris</i>	A	A
Hedge Bindweed	<i>Calystegia sepium</i>	—	WOC	thistle, bull	<i>Cirsium vulgare</i>	C	ND
hedgearsley	<i>Torilis arvensis</i>	B	B	thistle, Canada	<i>Cirsium arvense</i>	C	ND
henbane, black	<i>Hyocyamus niger</i>	C	—	thistle, Italian	<i>Carduus pycnocephalus</i>	A	A
herb Robert	<i>Geranium robertianum</i>	B	ND	thistle, musk	<i>Carduus nutans</i>	B	B
hoary alyssum	<i>Berteroa incana</i>	B	B	thistle, plumeless	<i>Carduus acanthoides</i>	B	B
houndstongue	<i>Cynoglossum officinale</i>	B	—	thistle, Scotch	<i>Onopordum acanthium</i>	B	B
hydrilla	<i>Hydrilla verticillata</i>	A	A	thistle, slenderflower	<i>Carduus tenuiflorus</i>	A	A
indigobush	<i>Amorpha fruticosa</i>	B	—	toadflax, Dalmatian	<i>Linaria dalmatica</i> ssp. <i>dalmatica</i>	B	B
ivy, Atlantic	<i>Hedera hibernica</i>	C	ND	toadflax, yellow	<i>Linaria vulgaris</i>	C	ND
ivy, English	<i>Hedera helix</i> Baltica	C	ND	velvetleaf	<i>Abutilon theophrasti</i>	A	A
ivy, English	<i>Hedera helix</i> Pittsburgh	C	ND	white bryony	<i>Bryonia alba</i>	B	B
ivy, English	<i>Hedera helix</i> Star	C	ND	whitetop, hairy	<i>Cardaria pubescens</i>	C	—
johnsongrass	<i>Sorghum halepense</i>	A	A	wild carrot	<i>Daucus carota</i>	B	ND
knapweed, bighead	<i>Centaurea macrocephala</i>	A	A	wild chervil	<i>Anthriscus sylvestris</i>	B	B
knapweed, black	<i>Centaurea nigra</i>	B	B	wild four o'clock	<i>Mirabilis nyctaginea</i>	A	—
knapweed, brown	<i>Centaurea jacea</i>	B	B	yellow archangel	<i>Lamiastrum galeobdolon</i>	—	ND
knapweed, diffuse	<i>Centaurea diffusa</i>	B	B	yellow flag iris	<i>Iris pseudacorus</i>	C	ND
knapweed, meadow	<i>Centaurea jacea</i> x <i>nigra</i>	B	B	yellow floating heart	<i>Nymphoides peltata</i>	B	B
				yellow nutsedge	<i>Cyperus esculentus</i>	B	B

1. WSNWCB, 2008.  
2. King County, 2007.

A = Class A Noxious Weed  
B = Class B Noxious Weed

C = Class Noxious Weed  
ND = Non-Designated Noxious Weed

WOC = Weed of Concern  
— = Not on list

**TABLE 4**  
**REQUIRED DELIVERABLES AND IMPLEMENTATION STEPS**

Vigor Shipyards Habitat Projects  
Seattle, Washington

<b>Deliverables and Implementation Steps</b>	<b>Completion Schedule</b>
Effective Date of the Consent Decree (CD)	
Submit Draft Sampling and Analysis Plan (SAP) for Pre-Design Investigation to Trustees and USEPA for Review	Within 60 Days of Effective Date of CD
Conduct Pre-Design Investigation	Within 60 days of SAP Approval
Submit Conceptual Design Package to Trustees for Review	Within 180 days of Effective Date of CD
Submit Habitat Mix Gradations and Substrate Selection Package to Trustees for Review	Concurrent with Conceptual Design Package
Submit Preliminary Design Package to Trustees for Review	Within 180 days of Trustee Approval of Conceptual Design and Habitat Mix Gradations and Substrate Selection Packages
Submit JARPA Permit Application	Within 30 days of Trustee Approval of Preliminary Design Package
Submit Remedial Action Work Plan (RAWP) to USEPA for Review	Within 60 days of Submitting the Preliminary Design Package to Trustees for Review
Submit Final Design Package to Trustees for Review	Within 90 days of Trustee Approval of Preliminary Design Package
Submit Maintenance and Monitoring Plan to Trustees for Review	Concurrent with Final Design Package
Prepare Construction Documents	Within 90 days of Trustee Approval of Final Design Package
Engage Contractor and Implement Construction ( <i>Note that in-water construction activities can only occur with permitted "fish windows." Construction is anticipated to require two in-water construction seasons.</i> )	Following Trustee Approval of Final Design Package and within 60 days of Receipt of Required Permits
Submit Construction Completion Report to Trustees and USEPA for Review	Within 60 days of Completion of Construction
Implement Monitoring and Maintenance Plan and Submit Monitoring and Maintenance Reports to Trustees	Following Completion of Construction – "Year 0" Monitoring is performed within 60 days of completion of planting
Submit Monitoring Completion Report to Trustees	Within 90 days of completion of the 10-year Monitoring Period
Submit written Notice of Completion of Vegetation and Habitat Development and Monitoring Obligations to Trustees	Within 90 days of completion of the 10-year Monitoring Period
Submit Long-Term Stewardship Plan to Trustees for Review	Within 120 days of completion of the 10-year Monitoring Period

## Figures

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***Before***



***After***

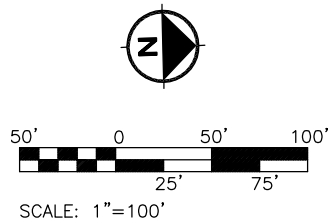
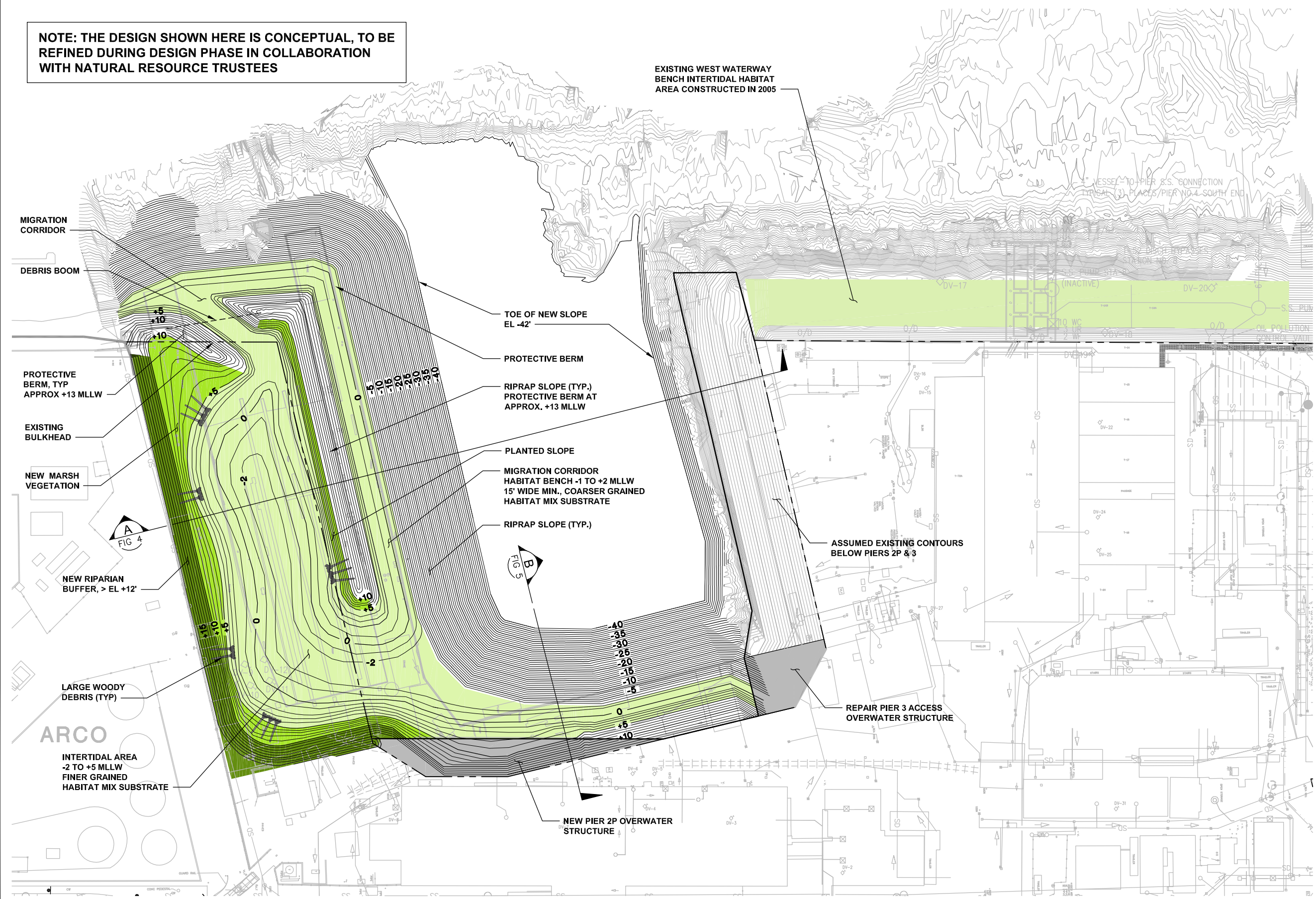


Note: The design shown is conceptual, to be refined during design phase collaboration with Natural Resource Trustees



NOTE: THE DESIGN SHOWN HERE IS CONCEPTUAL, TO BE REFINED DURING DESIGN PHASE IN COLLABORATION WITH NATURAL RESOURCE TRUSTEES

NOTES:  
1. ELEVATIONS SHOWN ARE IN MLLW VERTICAL DATUM.



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NO.	DATE	BY	REVISION



NRD SETTLEMENT  
  
**SOUTHWEST YARD  
PROPOSED DEVELOPMENT**

DRAWN: JH	PROJECT NO.: 111088
DESIGN: SS	SCALE: 1"=100'
CHECKED: BR	DATE: MARCH, 2017
DRAWING NO.	<b>FIGURE 2</b>
SHEET NO.	OF



Plotted: Mar 02, 2017 - 8:44am jhollenbach Layout: Layout1  
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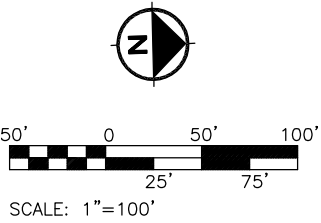


**ZONE 3:**  
OPEN-WATER RESTRICTED AREA. NO STRUCTURES OR MOORAGE ALLOWED. VESSEL ACCESS ALLOWED FOR TEMPORARY SUPPORT OPERATIONS ONLY. BETWEEN MARCH 1 AND JUNE 30 OF EACH YEAR, NON-EMERGENCY MOTORIZED VESSEL OPERATIONS RESTRICTED TO 3 HOURS MAXIMUM DURATION PER 24-HOUR PERIOD.

**ZONE 2:**  
SHIPYARD OPERATIONS WITH RESTRICTIONS. POTENTIAL FUTURE STRUCTURES RESTRICTED TO DOLPHINS, NO PIERS, NO RESTRICTIONS ON MOORAGE. BETWEEN MARCH 1 AND JUNE 30 OF EACH YEAR, NON-EMERGENCY MOTORIZED VESSEL OPERATIONS RESTRICTED TO 3 HOURS MAXIMUM DURATION PER 24-HOUR PERIOD.

**ZONE 1:**  
UNRESTRICTED SHIPYARD OPERATIONS, 170' FROM FACE OF PIER 3. POTENTIAL FUTURE DRYDOCK MOORAGE MUST BE WITHIN THIS AREA

**NOTES:**  
1. ELEVATIONS SHOWN ARE IN MLLW VERTICAL DATUM.



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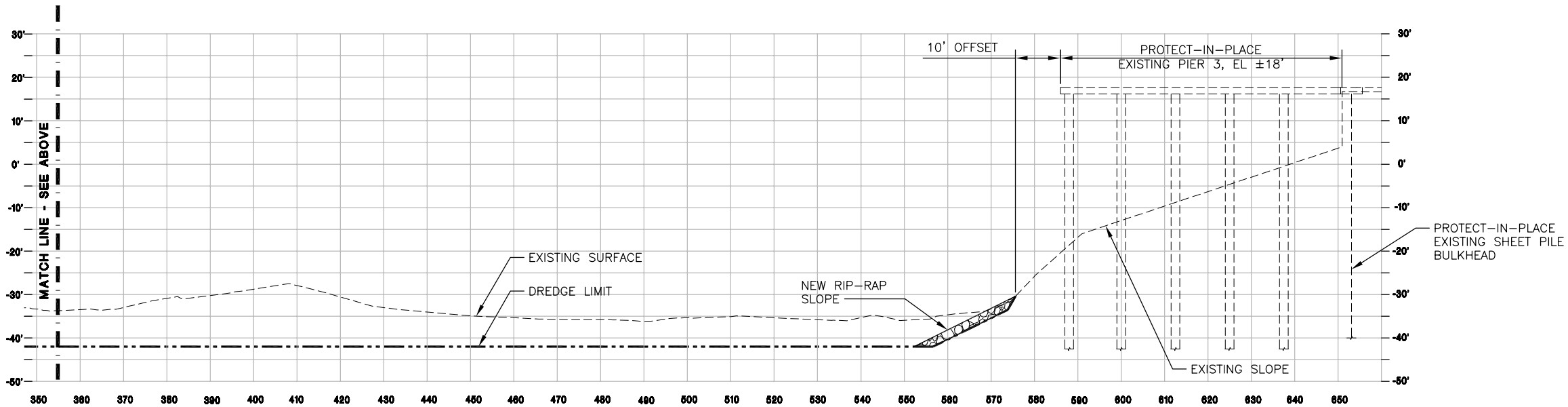
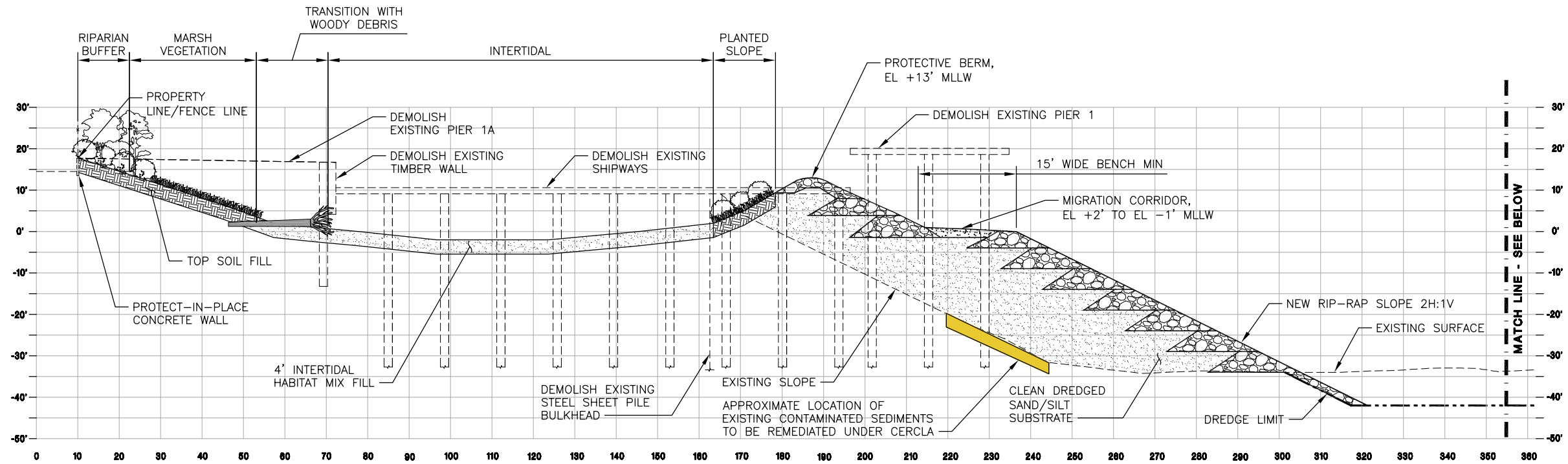
NO.	DATE	BY	REVISION



**NRD SETTLEMENT**  
**SOUTHWEST YARD**  
**OPEN WATER RESTRICTED AREAS**

DRAWN: JH	PROJECT NO.: 111088
DESIGN: SS	SCALE: 1"=100'
CHECKED: BR	DATE: MARCH, 2017
DRAWING NO.	<b>FIGURE 3</b>
SHEET NO.	OF

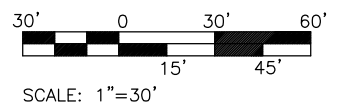
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M:\2011\111088 NRD Settlement\Drawings\Current Exhibits\2017-03-01 SW Yard Figures\2017-03-01 SK-4 SW Yard Sections.dwg



**SECTION A**  
SCALE: 1"=30'

**NOTES:**

- ELEVATIONS SHOWN ARE IN MLLW VERTICAL DATUM.



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NO.	DATE	BY	REVISION

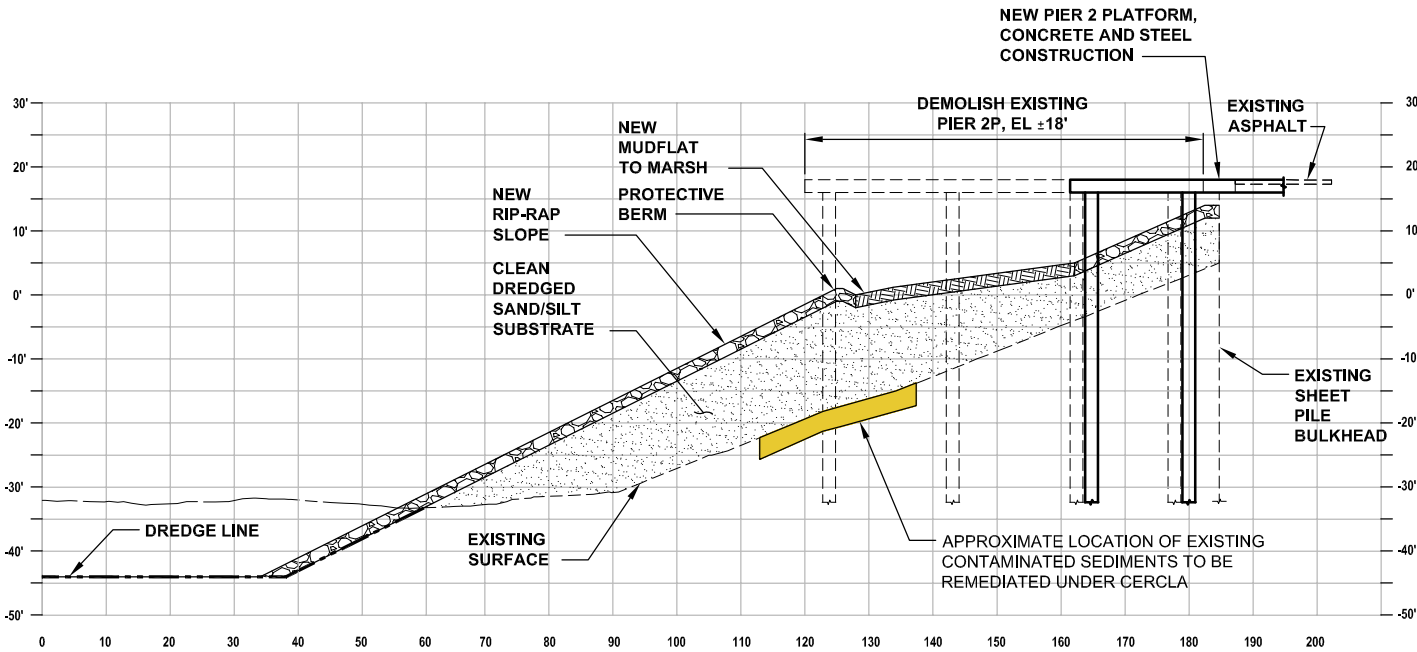
**VIGOR**  
SHIPYARDS

NRD SETTLEMENT

**SOUTHWEST YARD  
SECTIONS**

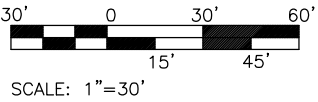
DRAWN: JH	PROJECT NO.: 111088
DESIGN: SS	SCALE:
CHECKED: BR	DATE: MARCH, 2017
DRAWING NO.	<b>FIGURE 4</b>
SHEET NO.	OF

Plotted: Mar 02, 2017 - 9:55am  
M:\2011\111088 NRD Settlement\Drawings\Current Exhibits\2017-03-01 SW Yard Figures\2017-03-01 SK-5 SW Yard Sections.dwg



**SECTION B**  
SCALE: 1"=30'

- NOTES:**
- ELEVATIONS SHOWN ARE IN MLLW VERTICAL DATUM



**DRAFT**



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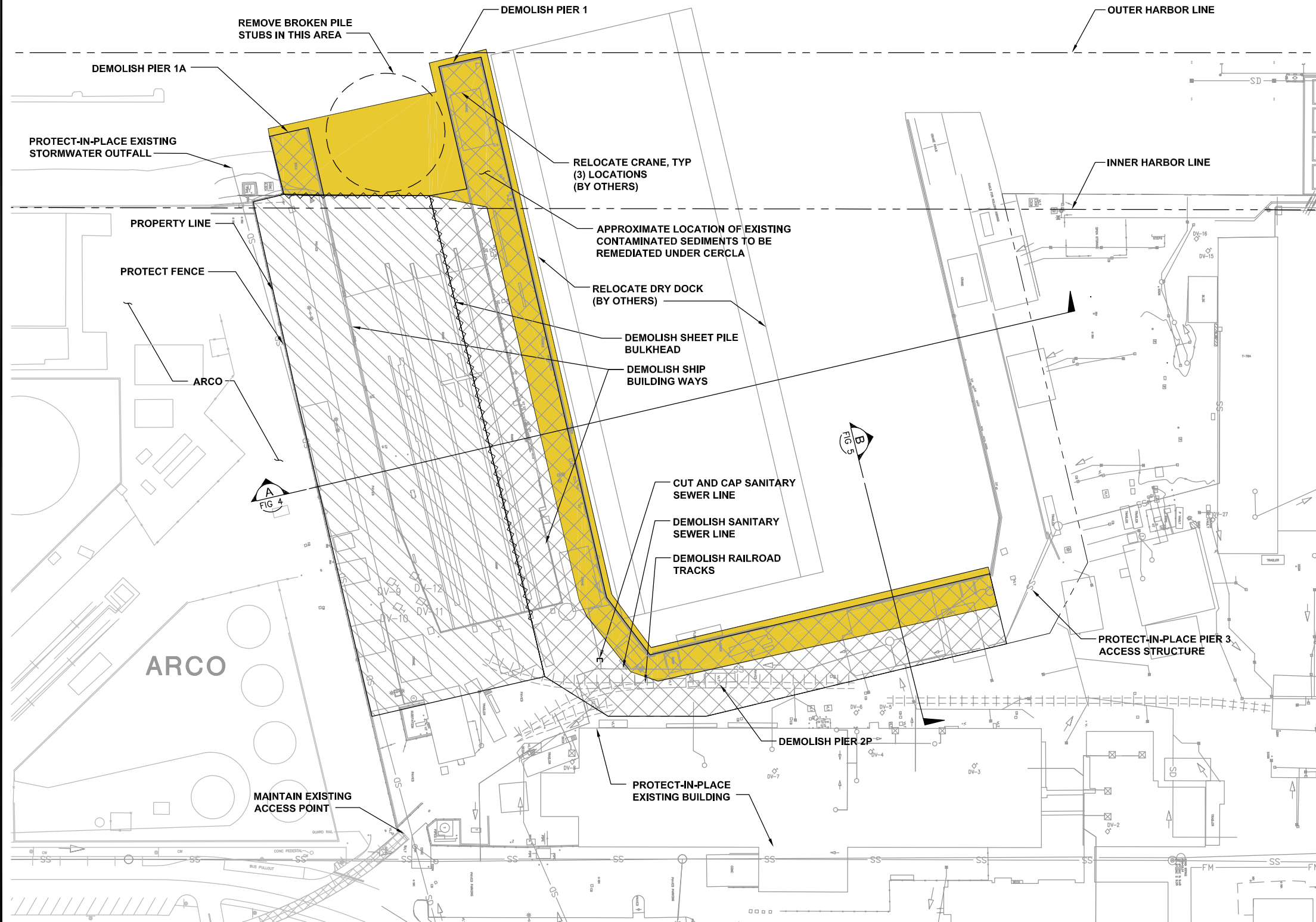
NRD SETTLEMENT

**SOUTHWEST YARD  
SECTIONS**

DRAWN: JH	PROJECT NO.: 111088
DESIGN: SS	SCALE:
CHECKED: BR	DATE: MARCH, 2017
DRAWING NO.	<b>FIGURE 5</b>
SHEET NO.	OF



Plotted: Mar 02, 2017 - 9:59am  
M:\2011\111088 NRD Settlement\Drawings\Current Exhibits\2017-03-01 SW Yard Figures\2017-03-01 SK-6 Demolition Plan.dwg  
jholenbach Layout: Layout1



**NOTES:**

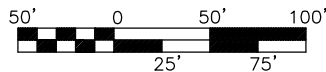
1. PRIOR TO DEMOLITION THE OWNER WILL SALVAGE AND REMOVE ALL ITEMS WITHIN DEMOLITION LIMITS. ALL OTHER ITEMS SHALL BE REMOVED AND DISPOSED OF.
2. UTILITIES SHOWN ARE APPROXIMATE IN NATURE AND HAVE BEEN OBTAINED FROM AVAILABLE RECORD DRAWINGS. ALL UTILITIES SHALL BE CUT AND CAPPED AT THE LIMIT OF DEMOLITION.
3. ALL PILES SHALL BE REMOVED COMPLETELY.

**LEGEND:**

- LANDSIDE STRUCTURE DEMOLITION
- OVERWATER STRUCTURE DEMOLITION
- APPROXIMATE LOCATION OF EXISTING CONTAMINATED SEDIMENTS TO BE REMEDIATED UNDER CERCLA

**DEMOLITION PLAN**

SCALE: 1"=100'



SCALE: 1"=100'



**DRAFT**

**kpff**

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**VIGOR**  
SHIPYARDS

NRD SETTLEMENT

**SOUTHWEST YARD  
DEMOLITION PLAN**

DRAWN: JH	PROJECT NO.: 111088
DESIGN: SS	SCALE: 1"=100'
CHECKED: BR	DATE: MARCH, 2017
DRAWING NO.	<b>FIGURE 6</b>
SHEET NO.	OF